served expansions and contractions of butterflies such as *Calpodes ethlius* (Stoll) and *Siproeta stelenes biplagiata* (Fruhstorfer) in Central Florida. Because of larval hostplant relations, we also must remember that larvae might inadvertantly be transported with nursery plants from different areas within the state. However, the lycaenid records listed here were made long after the active growth period when exotic plants would normally be brought into Central Florida for sale in local nurseries.

We consider voucher specimens to be an absolute necessity in faunal survey studies in order to adequately determine the taxa represented in an area. Vouchers of *M. azia* and *E. angelia* discussed here have been deposited in the collections of the Allyn Museum of Entomology, Florida Museum of Natural History.

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REPRODUCTIVE ADAPTATIONS OF THE TASAR SILKMOTH, *ANTHERAEA MYLITTA* (SATURNIIDAE), TO EMERGENCE SEASON

Additional key words: ovary, coupling, fecundity, hatching, diapause.

Most insects survive periods of environmental stress by entering a state of diapause. The Indian tropical tasar silkworm, *Antheraea mylitta* Drury, completes two to three generations in a year (Sinha & Chaudhuri 1992), and in bi/trivoltine broods undergoes pupal diapause for a period of about six to seven months to overcome unfavorable environmental conditions (Dash & Nayak 1988, Kapila et al. 1991, Sinha & Chaudhuri 1992). Pupal diapause in this species normally terminates at the end of May and eclosion begins in June with the advent of rain (Sinha & Chaudhuri 1992). This is known as optimal seasonal emergence. However, in the diapausing brood a portion of the pupae hatch 1–2 months early, emerging in a presumably unfavorable climate before the rainy season (Kapila et al. 1991). The physiological/hormonal basis of this erratic eclosion remains unclear, although endocrine regulation of pupal diapause in other insects has been well documented (Browning 1981, Denlinger 1985). Daily patterns of insect behavior (e.g., locomotion, feeding, emergence, mating, oviposition, and hatching) are governed by daily cycles of temperature, humidity, and light intensity as well as by physiological events (Beck 1983, Ratte 1985, Ashby & Singh 1990). We report here on ovary morphology and reproductive behavior of "seasonally" and "unseasonally" emerged tasar silk moths.

One thousand diapausing *A. mylitta* pupae of each sex were observed as they emerged

TABLE 1. Emergence and reproductive parameters for seasonally and unseasonally emerged *Antheraea mylitta*. Asterisks indicate significant differences between seasonally and unseasonally emerged moths ($P < 0.05$, t-tests).

Parameters		Seasonal	Unseasonal
% Emergence			
	male	62.80	0.70
	female	67.90	0.90
	total	65.35	0.80
% Coupling			
	self	47.42	11.11
	mechanical	37.70	55.55
	total	85.12	66.66
Female moth weight (gm)*		6160.12 ± 110.95	4015.50 ± 210.97
Ovary weight (mg)*		3598.75 ± 98.08	2092.50 ± 55.87
Single egg weight (mg)*		10.05 ± 0.10	8.07 ± 0.13
Number of eggs			
	laid*	162 ± 5	10 ± 1
	unlaid	44 ± 4	42 ± 1
	total*	206 ± 8	52 ± 2
% Eggs			
	laid*	78.96 ± 1.59	19.59 ± 1.71
	unlaid*	21.04 ± 1.59	80.41 ± 1.71
Incubation period (d)*		8.55 ± 0.15	7.50 ± 0.20
% Hatching*		80.76 ± 1.58	18.48 ± 3.93
Average temperature (°C)			
	minimum*	26.80 ± 0.31	23.10 ± 0.28
	maximum*	30.36 ± 0.26	32.97 ± 0.24
Average relative humidity*		73.46 ± 1.27	39.96 ± 1.73

in 1991. These had fed previously as larvae on the leaves of *Terminalia arjuna*. Moths that emerged during March–April were considered "unseasonal" whereas those that emerged during June–July were considered "seasonal." Emergence and mating percentage were recorded for each group. Moths were allowed to pair naturally for about three or four hours; adult females unable to mate were coupled manually. Subsequently, the moths were allowed to oviposit. Egg production was recorded by counting the number of eggs laid by females, and the number of unlaid eggs was determined by dissection. Ovary morphology was assessed after removing the whole system from the adult moth. Temperature and relative humidity were recorded throughout the observation period.

Table 1 shows variation in reproductive parameters in relation to emergence. Unseasonal eclosion was rare in comparison to seasonal eclosion, and the natural coupling percentage of unseasonally emerged moths was lower. Unseasonally emerged female moths had lower body weight, lower total ovary weight, lower single egg weight, and decreased egg production, egg laying capacity and egg hatching. Table 2 indicates that unseasonally emerged moths had smaller ovaries, ovarioles, and mature eggs. Unseasonally emerged

TABLE 2. Physical dimensions of ovary, ovarioles and mature eggs (after laying) of unseasonally and seasonally emerged *Antheraea mylitta*. Significant differences between seasonally and unseasonally emerged moths existed for all traits measured ($P < 0.05$, t-tests).

	Ovary		Ovariole		Mature eggs	
	Length	Width	Length	Width	Length	Width
Seasonal	55.67 ± 0.54	14.67 ± 0.27	84.25 ± 0.58	3.07 ± 0.03	3.04 ± 0.04	2.53 ± 0.02
Unseasonal	42.33 ± 1.19	11.33 ± 0.54	65.12 ± 0.61	2.50 ± 0.02	2.54 ± 0.04	2.19 ± 0.04

FIG. 1. Ovaries of seasonally (left) and unseasonally (right) emerged *Antheraea mylitta*.

moths also frequently had oocyte-free zones when compared to seasonally emerged moths (Fig. 1).

Temperature fluctuated more during March–April than during the months of June–July, and relative humidity was lower in March–April. Variation in ambient environmental factors may be responsible for some of the observed differences in reproductive biology in *A. mylitta* (see e.g., Messenger 1964, Hagstrum & Leach 1973, Beck 1983, Sidibe & Lauge 1977, Ratte 1985, Ochieng'-Odero 1991), but we do not yet know why pupal diapause occasionally terminates early in this species. Biogenic amines have been implicated in the regulation of development, especially in diapause induction and termination (Puiroux et al. 1990), and our own unpublished observations suggest that octopamine plays a major role in termination of pupal diapause in *A. mylitta*. Unseasonally emerging tasar silk moths are not being exploited commercially at present.

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